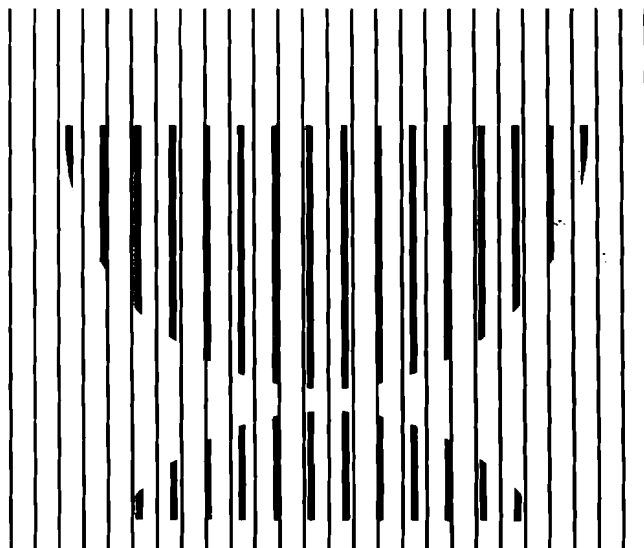


CBO STAFF MEMORANDUM

**THE COSTS OF THE
ADMINISTRATION'S PLAN FOR THE
AIR FORCE THROUGH THE YEAR 2010**

December 1991



**CONGRESSIONAL BUDGET OFFICE
SECOND AND D STREETS, S.W.
WASHINGTON, D.C. 20515**

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This memorandum was prepared by the Congressional Budget Office (CBO) in response to a request from the Chairman of the Committee on Armed Services of the House of Representatives. It is one of a series of memoranda, requested by the Chairman, analyzing future costs of the Administration's plans for defense forces. In keeping with CBO's mandate to provide objective and nonpartisan analyses, the memorandum makes no recommendations.

Lane Pierrot, William P. Myers, and David Mosher performed the analysis, with assistance from Steve Glazerman. Robert F. Hale, Michael A. Miller, Neil M. Singer, and R. William Thomas supervised the effort. Sherwood Kohn edited the manuscript. Cindy Cleveland prepared it for publication.

NOTES:

Unless otherwise indicated, all years referred to in this memorandum are fiscal years.

Details in the text and tables may not add to totals because of rounding.

Unless otherwise indicated, all costs are expressed in billions of fiscal year 1992 dollars of budget authority.

SUMMARY

Under the Administration's current plan, Air Force budgets are expected to increase through 1993 to a level of about \$88 billion. Budgets would then decline to \$82 billion in 1995 and \$78 billion in 1997 (see Figure 1).

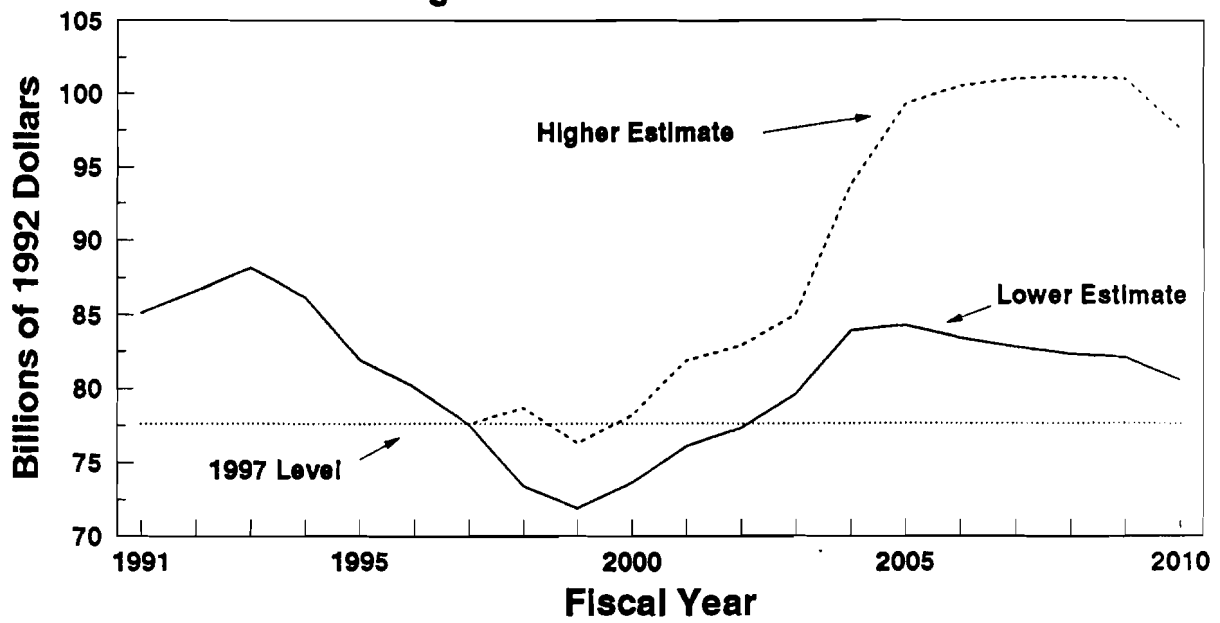
The Administration has not made public its plans for the years after 1997. Based on the Administration's statements and goals, however, the Congressional Budget Office (CBO) estimates that even less funding might be needed beyond 1997 to carry out the Administration's likely plans. By the year 2000, the Air Force might need as little as \$74 billion, under a lower estimate that assumes only limited growth in the future cost of weapons. The continued decline in budgets under the lower estimate reflects the expected completion of major procurement programs, principally the B-2 strategic bomber. Under a higher estimate, which assumes continued growth in the cost of weapons, the Air Force budget would decrease modestly and then return to its 1997 level by the year 2000.

Beyond the year 2000, CBO projects that Air Force budgets would have to increase under the Administration's plan. In 2010 the Air Force budget could range between \$81 billion under the lower estimate and \$98 billion under the higher estimate. Increases would be needed to pay for major new weapons systems, including the F-22 tactical fighter, the multirole fighter (MRF), and the missile portion of the small intercontinental ballistic missile (SICBM) program.

The range of cost estimates in this memorandum reflects differing assumptions about the cost of new weapons. The lower estimates assume that there is no growth in the unit cost of major weapons beyond currently planned levels, and that spending in funding categories for which detailed plans are not available, such as research and development and nonmajor procurement--procurement of a variety of items, including spare parts, tactical missiles, and satellites, for which the Administration's replacement goals are less clear--remain at previous levels, adjusted for force changes. The higher cost estimates, which are more consistent with past experience, assume that there is growth in the unit costs of major weapons that is not anticipated by program planners, and that spending for activities such as research and nonmajor procurement grows along with increases in other types of funding.

While Air Force funding would increase in the next decade under the Administration's plan, under CBO's assumptions of lower cost estimates it would remain near the planned 1997 level of funding for most of the period. Thus, if the Air Force can hold down costs in ways assumed by the lower

Figure 1. Higher and Lower Estimates of the Air Force Budget



SOURCE: Congressional Budget Office

estimate, the service should be able to afford a new family of weapons, including the F-22 aircraft, the MRF, and the SICBM, without real increases in its budget.

If past experience is a guide, however, and the higher cost estimates are more realistic, the Air Force budget would have to increase in the next decade to finance this new family of weapons. Real increases of as much as 31 percent above the planned 1997 level could be necessary.

Such increases will probably be difficult to achieve for several reasons. Air Force programs will face considerable competition from thirsty programs in the Army and Navy and from the Strategic Defense Initiative. Under the Administration's plan, all these programs, particularly those in the Navy, are likely to demand substantial increases in funding during the next decade, which could reduce the share of the total defense budget that is available to the Air Force. And, in the aftermath of the failed Soviet coup, the total defense budget may fall below the Administration's planned level. Additional cuts in defense funding could prevent the Air Force from carrying out the Administration's plan even if its share of total funding is not reduced.

THE ADMINISTRATION'S PLAN

In order to identify long-term cost trends, this memorandum seeks to estimate the Air Force budgets needed to accommodate the Administration's plan through the year 2010. The sources of assumptions about the Administration's plan differ depending on the time period. Through 1997, the Administration has provided detailed plans for the Air Force in its Future Years Defense Program (FYDP), submitted in February 1991, and CBO assumes these plans will be followed. Beyond 1997, detailed plans are not always publicly available. The Administration has, however, stated that the forces planned for 1997 represent the minimum that are necessary to protect U.S. security interests. Thus, it is assumed that forces will remain at their planned 1997 levels through the year 2010. Moreover, the Air Force has often stated its overall plans for modernization, either in documents provided to the Congress or in testimony. These statements provide the basis for assumptions about modernization.

The remainder of this section describes the assumptions about the Administration's plan in more detail. The Air Force is made up of three major types of forces: strategic forces for nuclear attack and defense against nuclear attack, tactical fighter and attack forces for conventional wars, and airlift forces that fly Army and Air Force equipment and personnel to fight in distant theaters.

Strategic Forces

To deter nuclear war, the United States relies on a triad of nuclear forces--submarine-based missiles, land-based missiles, and weapons on bombers. The Air Force is responsible for supporting two "legs" of this triad: land-based missiles and bomber weapons. Its budget includes all procurement and operating funding for intercontinental ballistic missiles (ICBMs) as well as for strategic bombers and the nuclear bombs and missiles delivered by those bombers.

Because of budgetary pressures and the recently signed Strategic Arms Reduction Talks (START) Treaty, the forces associated with the Air Force's two triad legs will probably shrink somewhat over the next decade. Through 1997, the largest reduction will occur in the ICBM force, which currently numbers 1,000 missiles. CBO assumes that, by 1997, the force will consist of 550 missiles, and that warheads on ICBMs will decrease from 2,450 to 2,000 as the Air Force retires the Minuteman II ICBMs. No new ICBMs will be procured during this period.

It is assumed that by 1999, the Air Force will have eliminated additional Minuteman warheads to comply with the limit of 6,000 countable warheads imposed by the START treaty. CBO assumes that reductions will be accomplished initially by reducing the number of warheads deployed on Minuteman III missiles from three to two. This memorandum assumes that the SICBM will be procured--beginning in 1999 and reaching a maximum rate of 60 missiles a year by 2001--and deployed in silos that formerly held Minuteman II missiles. Consistent with the Administration's apparent plans, although contrary to the expressed desire of some in the Congress, this paper assumes no development or deployment of a mobile-basing mode for SICBMs. In order to remain within the START limits, it is assumed that the Air Force will reduce the number of Minuteman III warheads and missiles as SICBMs are deployed. By the time all 500 SICBMs are deployed, Minuteman warheads and missiles would have to be reduced substantially. In order to comply with the START treaty, the Air Force might achieve this reduction, for example, by deploying 316 Minuteman III missiles with single warheads and 35 missiles with three warheads. Thus, it is assumed that by the year 2010, the ICBM force will consist of 901 missiles: 50 of the newer MX missiles, 351 Minuteman III missiles, and 500 SICBMs.

The strategic bomber fleet will also get smaller through 1997. CBO assumes that the total bomber inventory will decrease from 269 aircraft in 1991 to 215 aircraft in 1997 as the Administration retires all 77 older B-52G strategic bombers and begins deployment of the new B-2 bomber. CBO also

assumes that, by 1997, the Air Force will have 97 B-1 bombers and 95 B-52H bombers. Fifteen B-2s that have been bought before 1992 are scheduled to become part of the force.¹ The Administration's plan requested funds for 51 additional B-2 bombers in the 1992-1997 period, with nine more aircraft scheduled for procurement in 1998. Although the fate of these 60 remaining bombers is uncertain--Congressional action on the fiscal year 1992 budget has sharply reduced 1992 procurement and put the remainder of the bombers at risk--to reflect the intent of the Administration, CBO assumed for the purposes of this analysis that B-2s would be bought at currently planned levels to complete the 75-aircraft program. If these planes were bought, they would, when delivered, fill most of the expected gap in the bomber fleet. By the year 2005, the bomber force will have reached its planned steady-state level of 267 bombers, and no further bomber procurement is planned through 2010.

Tactical Fighter Forces

The number of Air Force tactical fighter forces will decline under the Administration's plan. Air Force tactical forces are scheduled to decrease by about 25 percent between 1990 and 1997, from about 36 wings (each with 72 aircraft) to about 26 wings. This memorandum assumes that the Air Force will retain 26 wings through the year 2010, which seems consistent with statements by General Colin Powell, Chairman of the Joint Chiefs of Staff, who said that the forces planned for the mid-1990s represent the minimum forces required to meet U.S. security needs.²

Six types of aircraft compose the Air Force's tactical fighter forces. The Air Force plans to buy two new types of planes to replace many of these aircraft in the 1991-2010 period. The F-22, formerly called the Advanced Tactical Fighter, will eventually replace today's F-15 aircraft as the Air Force's premier fighter. Designed to achieve air superiority, the F-22 is expected to have advanced stealth capability. Procurement of the F-22 is scheduled to begin in 1996 with four planes. Procurement would increase to about 48 planes a year and continue at that level at least through 2010.

According to the Administration's plan, procurement of today's F-16 aircraft, which is less expensive and less capable than the F-15 aircraft, will end in 1993. Eventually, the Air Force plans to design and buy a new

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1. Ten B-2s have been bought with procurement funds. Five bombers that were bought with development funds are scheduled to be modified to production configurations.
 2. Statement of General Colin Powell before the Defense Subcommittee of the House Committee on Appropriations, September 25, 1991.

multirole fighter (MRF) to replace older F-16 aircraft. Air Force plans for the MRF are much less certain than those for the new F-22 aircraft, but this memorandum assumes that the MRF would enter procurement around 2003. CBO assumes that MRF procurement levels will be somewhat lower than those of the F-16 it is to replace. Initially, the Air Force will procure 105 aircraft. Production would increase to a rate of about 150 aircraft a year by 2005 and continue at that rate through 2010.³

The Air Force expects that the new F-22 and MRF planes will make up the bulk of its future fighter inventories. But the service may also purchase a variant of a medium-range bomber being developed by the Navy (designated the AX) for its interdiction forces. This memorandum assumes, however, that these planes will be bought after procurement of the F-22 is completed. Their purchase is therefore beyond the 2010 horizon of this analysis.

Airlift and Tanker Forces

Aircraft designed to transport Army and Air Force units are another major category of Air Force planes.⁴ The Air Force maintains two types: intertheater airlifters (which can move materiel between continents) and intratheater airlifters (shorter-range aircraft designed for moving materiel within a military theater).

The Administration plans to field enough intertheater aircraft to maintain the Air Force's current capacity to transport troops and equipment through 1995. Today, the Air Force can transport a total of 48 million ton-miles per day. The Air Force projects that its transport capacity will increase to about 51 million ton-miles per day by 1997. The airlift fleet that supports this capability includes the large C-5 transport and the relatively smaller C-141. The Air Force is buying the new C-17, which is designed to carry loads of about 162,000 pounds for distances of 2,400 nautical miles without aerial refueling and anywhere in the world with refueling. The first C-17 was procured in 1988 and, under current plans, purchases would continue through 1999 at a rate of as many as 18 aircraft a year. By 1999, when procurement is scheduled to end, the Air Force will have purchased 120 C-17 aircraft. The Administration apparently plans no further purchases of intertheater airlift aircraft through 2010.

3. The assumption about the number of MRFs purchased annually is uncertain and is discussed more fully starting on page 15.

4. Among other categories are electronic warfare aircraft, trainers, and a variety of helicopters.

The Air Force has a fleet of about 460 C-130 aircraft to provide shorter-range or intratheater transport. This fleet is expected to decrease by about 10 percent in the 1990-1993 period. This memorandum assumes that the Air Force will continue to procure 12 C-130 aircraft a year, the annual procurement rate in the Air Force's plans for the 1993-1997 period. These new aircraft would partially replace older C-130 planes, although more C-130s must be bought to keep the fleet from decreasing further. The new C-17 aircraft should reduce the necessity for intratheater airlift because it is designed to take off and land on relatively short runways. CBO assumes that C-130 procurement would remain at these relatively modest levels because the Air Force may plan to replace it with an advanced tactical transport. Since plans for this plane are not firm, CBO has assumed that it would not enter procurement until beyond 2010.

In 1990, the Air Force's fleet of tanker aircraft consisted of almost 600 KC-135 aircraft and about 60 of the larger KC-10 planes. It is assumed that KC-10 inventories will remain at about 60 through the year 2010. It is possible, however, that the Administration will decrease the size of the KC-135 fleet as it cuts back on the number of strategic bombers, since the KC-135's primary mission is providing aerial refueling for these bombers in the event of a nuclear war. The Administration might also be willing to decrease these forces in view of modifications that increase the delivery capacity of tanker planes by about 50 percent, but details of such plans are not publicly available. In this memorandum it is assumed that tanker forces remain at 1997 levels through the year 2010.

PROJECTED OPERATING FUNDING

The Administration's plans would affect funds for operating the Air Force, which includes military personnel appropriations (which finance the pay and allowances of military personnel), operation and maintenance appropriations (which pay the daily operating costs of Air Force forces other than those for military personnel), and the operating portion of the family housing appropriation (which pays to maintain and operate homes for military personnel). Together, the money for these activities constituted about 57 percent of the total Air Force budget in 1991. Funding in these accounts is determined by the size of the forces and by the amount of money spent to maintain their peacetime readiness. Readiness is a term used by the Department of Defense (DoD) to describe whether forces are trained and equipped to respond rapidly to crises.

Military Personnel Appropriations

The number of people the Air Force employs, and their rates of pay, largely determine funding in the military personnel appropriations. Under the Administration's plan, active personnel would be reduced sharply during the 1990-1995 period, declining by about 20 percent from 539,300 people to 437,000. By 1997, the number of Air Force active-duty personnel would total about 436,000.

While the Administration plans to cut Air Force personnel in the 1990-1995 period, personnel levels in the part-time reserves--including the Air Force Reserve and the Air National Guard--are actually expected to increase slightly. Personnel in the two service components would increase from the 1990 level of 80,600 and 117,000, respectively, to 82,600 and 119,100 by 1995. Thus, the reserve share of total Air Force personnel would rise from 27 percent in 1990 to about 32 percent in 1995.

Because active-duty personnel are considerably more expensive than part-time reserves, the net effect of these changes is a decrease in overall personnel spending of about 25 percent between 1990 and 1995, or from about \$23 billion to \$18 billion. In 1996 and 1997, planned funding levels remain roughly constant at the 1995 level.

This memorandum assumes that the real level of personnel funding remains roughly constant at the 1997 level through 2010. This assumption seems consistent with projections of the numbers of forces, which remain constant.

Operation and Maintenance

Operation and maintenance (O&M) appropriations constitute most of the rest of the Air Force's operating costs. O&M funds pay for a wide variety of items and activities, including civilian pay, fuel, medical expenses, and maintenance of DoD's stock of equipment and facilities. Air Force O&M funding totaled almost \$28 billion in 1990 but decreased to about \$25 billion in 1991, at least partly because of declines in the price of fuel.⁵ It is scheduled to decrease modestly beyond 1991, to \$23 billion in 1995 and \$22 billion by 1997.

Since most major force changes should be complete by 1997, CBO assumes that the real level of O&M appropriations will stay constant at the

5. Totals include dollars in the Air Force's revolving funds.

1997 level through 2010. There is, however, much uncertainty about projected O&M funding, particularly in the next decade. By that time, new pieces of equipment (including the B-2 bomber, F-22 aircraft, C-17 aircraft, and SICBM) would have entered the inventory in substantial numbers. In some cases, the new equipment has been designed to hold down maintenance needs, which could reduce O&M costs. At the same time, the new weapons systems will be more complex than those that they replace, which could increase O&M costs.

Total Operating Funds

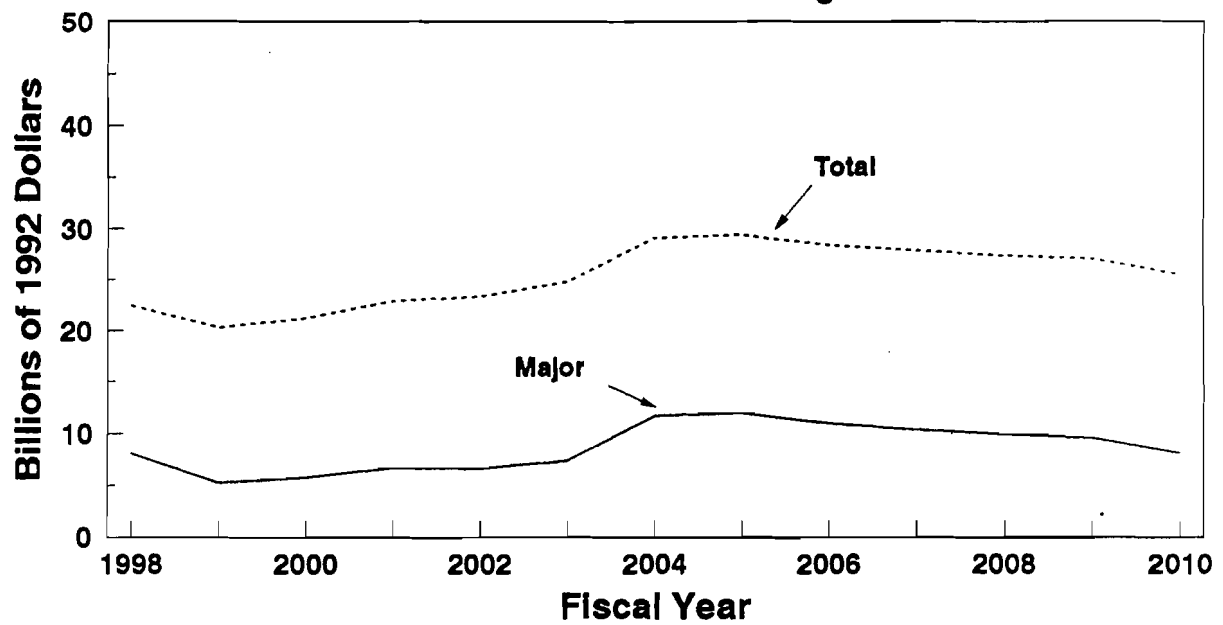
In addition to funds for military personnel and operation and maintenance, the Air Force operating budget includes a relatively small amount of money to operate family housing. Including these funds, the total bill for the operating accounts declined from \$52 billion in 1990 to \$48 billion in 1991. Operating funding would decline further under the Administration's plan, to about \$42 billion by 1995 and to about \$40 billion by 1997. Beyond 1997, this memorandum assumes that operating funding in all categories remains constant in real terms at the 1997 level of \$40 billion.

PROCUREMENT FUNDING

Another major portion of the Air Force budget--28 percent in 1991--is devoted to the purchase of a variety of major weapons systems, such as B-2 bombers and F-16 fighters, as well as more minor items like trucks, radios, and spare parts. Procurement funding totaled about \$24 billion in 1991, down about 28 percent from its 1990 level. The Air Force plans to increase procurement funding through 1994 to a level of about \$28 billion, partly to finance the simultaneous purchase of the B-2 bomber and the C-17 transport. After 1994, procurement funding would decline modestly to about \$27 billion in 1997.

The pattern for the remainder of the period through 2010 depends on assumptions about the costs of various major weapons, particularly tactical fighters, as well as cost trends for nonmajor weapons. Under the lower estimates in this memorandum, which assume that steps are taken to hold down costs, procurement would decline to about \$23 billion in 1998 and \$20 billion in 1999 as B-2 purchases decrease and are finally completed. Procurement would increase only modestly to a maximum of \$29 billion in 2004 and 2005, and would then decline again to about \$26 billion in 2010 or about \$2 billion less than the 1997 level (see Figure 2).

Figure 2. Major and Total Procurement In the Lower Estimate of the Air Force Budget



SOURCE: Congressional Budget Office

Under the higher assumptions, which are more consistent with past experience, procurement funding would remain close to or below 1997 levels through the year 2000 but begin to rise rapidly in the early part of the next decade as F-22 and SICBM procurement increases (see Figure 3). It would rise sharply in 2004 when the number of multirole fighters increases and continue to rise through most of the next decade, reaching a peak of about \$45 billion in 2008. After 2008, it declines slowly and totals about \$41 billion by 2010. These trends reflect costs for major, as well as costs for nonmajor, weapons.

Major Weapons

Lower and higher estimates of costs are based in this memorandum on the number of major weapons to be bought under the Administration's plan.

Lower Estimate. In most cases, the lower estimate of costs assumes that new major weapons systems can be purchased at the unit costs currently estimated by the Administration. These unit costs suggest, for example, that F-22 aircraft would cost about \$80 million apiece while SICBMs would cost about \$35 million apiece (see Table 1).

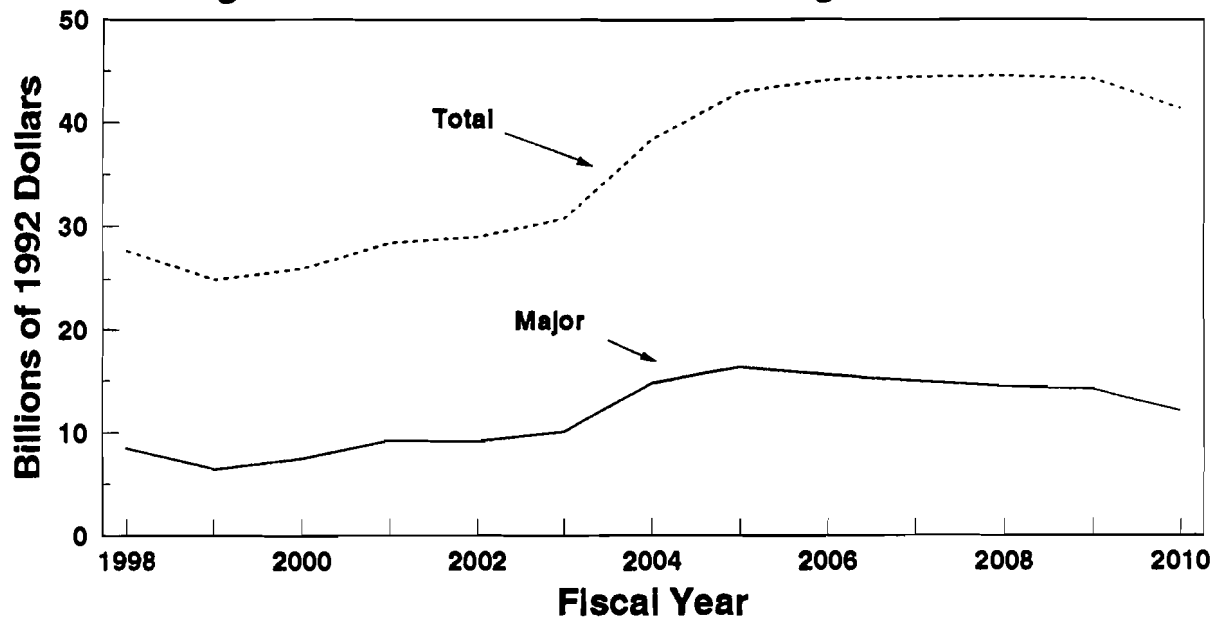
TABLE 1. AVERAGE UNIT PROCUREMENT COSTS FOR AIR FORCE SYSTEMS ASSUMED BY CBO (In millions of 1992 dollars)

	Lower Estimate	Higher Estimate
Advanced Tactical Fighter	80	110
Multirole Fighter	35	50
Strategic Bomber	540	540
C-17 Airlift Aircraft	225	225
Small Intercontinental Ballistic Missile	35	55

SOURCE: Congressional Budget Office based on Department of Defense data.

NOTE: Unit costs are rounded to the nearest \$5 million.

**Figure 3. Major and Total Procurement in the
Higher Estimate of the Air Force Budget**



SOURCE: Congressional Budget Office

In one important exception to CBO's rules, the lower estimate of costs is not based on the Administration's estimate of unit costs. The Administration has said that it expects to pay about \$25 million apiece for the new MRF, but the lower estimate of costs assumes that the new fighters cost about \$35 million apiece. Estimates of MRF costs must be based on historical trends, because the Air Force has yet to design the new plane or even to specify its desired capabilities. Despite the uncertainty, the Administration has apparently decided to create an entirely new aircraft rather than to modify an existing plane. Current plans call for production of the F-16 aircraft--today's low-cost fighter and the most likely candidate for modification--to end in 1993, about a decade before the MRF aircraft is to enter into production.

Based on experience with Air Force aircraft built at least since the 1950s, newly designed Air Force fighter aircraft have always increased in cost by at least 80 percent. The Administration's estimate of \$25 million would represent an increase of only 30 percent. Such a small increase would fall substantially below the historical minimum and would raise the question of why, if changes are to be so modest, the Administration plans to design an entirely new plane.

In order to provide a more realistic estimate of minimum costs, this memorandum assumes that MRFs would cost about \$35 million apiece. This would represent an increase of about 80 percent above the cost of today's F-16 aircraft, the smallest increase ever achieved since the 1950s for a newly designed plane. In addition, it seems unlikely that the Air Force will be willing to do without at least some of the enhancements in capability that increase the cost of new aircraft. Air Force Chief of Staff General Merrill McPeak suggested that stealth technology, being a revolutionary technological breakthrough, will be incorporated in all new combat aircraft.⁶ Incorporating stealth technology will, of course, drive up the price of the new fighter. Moreover, this memorandum's estimate may actually be consistent with the Administration's figure. According to press reports, a memorandum circulated by Major General Joseph W. Ralston, when he was director of tactical programs in the Air Force's acquisition office, prior to release of the need statement for the fighter, suggested ceilings on the fighter's "fly-away" cost ranging from \$25 million to \$35 million.⁷ Even if the fighter's cost falls at the lower end of the range, fly-away costs do not include a variety of items

6. "McPeak: Soviets Can Detect B-2, But No Defense Against Stealth," *Aerospace Daily*, October 10, 1991, p. 62.

7. David A. Fulghum, "Third World Threat, Military Budget Squeeze Shaped Early Concepts of Multirole Fighter," *Aviation Week and Space Technology*, October 21, 1991, p. 20.

that must be bought with procurement funds. If these other items were included in the cost, it would be more consistent with CBO's assumption.

Under the assumptions included in the lower estimate, the costs of major procurement would decrease from about \$8 billion in 1998 to \$5 billion or \$6 billion in 1999 and 2000 and then grow to a high of about \$12 billion in 2005 (see Figure 2). Most of the costs are associated with tactical aircraft. Indeed, after 1998, there are no major procurement costs associated with strategic aircraft. And by the middle of the next decade tactical aircraft procurement accounts for almost 80 percent of the estimates for major procurement funding.

Higher Estimate. If history is a guide, the unit costs of weapons used in arriving at the lower estimate are too low. In the past, the actual costs of weapons systems have increased above initial estimates, often by substantial amounts. Thus, this analysis includes higher estimates of Air Force procurement costs that assume that the F-22 and MRF aircraft and the SICBM grow in cost.

The higher estimate assumes that costs of the F-22 aircraft will rise to a level of about \$110 million, almost 40 percent higher than the Administration's current estimate (see Table 1). The higher F-22 cost is based on historical patterns. Specifically, this estimate applied the ratio between the average costs of the A/B models of the F-15 and the cost of the F-4, its predecessor, to the costs of the F-15. Some of this assumed growth must have already begun. Air Force experts told the Congress earlier this year that their estimates of F-22 unit prices have already increased by 8 percent, even though the plane is just entering full-scale development.

The higher cost of \$50 million for the MRF is based on Air Force estimates for the cost of an F-21++, a radically modified version of the F-16 that was considered as an alternative to the F-22 aircraft. The F-21++ has substantial stealth capability as well as greater range and enhanced avionics, and in fact might have more capability than the Air Force expects of the MRF, which is slated to replace the relatively less-capable F-16 aircraft. On the other hand, the F-21++ may be a good proxy for the MRF. The Air Force argues that stealth is an important improvement in capability, and the F-21++ aircraft would have stealth capability. Also, \$50 million is roughly consistent with the \$35 million fly-away cost at the higher end of the Air Force's range of estimates.

Under the higher estimate, the unit cost of the SICBM is expected to increase by about 50 percent. That increase is within the range of the average percentage growth experienced by a number of past DoD weapons systems,

especially for systems that are not expected to enter production for a number of years.⁸

Under the assumptions of the higher estimate, procurement costs of major weapons would dip from about \$9 billion to \$7 billion in 1999 and \$8 billion in 2000, and then increase to a peak of \$16 billion in 2005. Although major weapons costs would decline through the rest of the decade, they would only fall to about \$12 billion by 2010.

Uncertainty About the Number of MRF Aircraft

Both the higher and lower estimates of costs assume that the Air Force purchases the same number of various types of aircraft. There is, however, much uncertainty about the number of MRF aircraft that would be purchased during the next decade because it is not known how long existing F-16 aircraft will remain in service.

This memorandum assumes that the Air Force would buy about 150 MRF aircraft a year during the latter part of the next decade as replacements for older F-16 aircraft. That level of procurement is roughly consistent with the currently stated Air Force plan, which calls for retirement of tactical aircraft after 22 years of service.⁹

It is possible, however, that a lessening of threats to U.S. security will permit the Air Force to retain its F-16 aircraft for an average of more than 22 years. That figure is based on the assumption that after about 22 years, maintaining technological superiority over potential enemies would require a new plane. If the Soviet Union does not modernize its air forces as quickly as it has in the past (or if it does not modernize them at all), the Air Force could retain its planes longer.

For example, the Air Force might be able to keep F-16 aircraft for 28 years, the approximate time in which they might wear out. If the Air Force

8. Karen W. Tyson, J.R. Nelson, Neang I. Om, and Paul R. Palmer, "Cost and Schedule Growth in Major Acquisition Programs: An Empirical Analysis," *Proceedings of the 1989 Acquisition Research Symposium* (Washington, D.C.: Defense Systems Management College and the Washington, D.C., Chapter of the National Contract Management Association, 1989), p. 125; and Gary Bliss, "The Accuracy of Weapons Systems Cost Estimates," presentation to the 59th Military Operations Research Symposium, U.S. Military Academy, West Point.

9. Actually, the Air Force would have to purchase more than 180 aircraft a year if all older tactical aircraft were retired after exactly 22 years. Thus, the purchase of 150 aircraft a year assumes that there are some delays in retirement or that some units are left short of aircraft.

were to change this goal it might be able to support its fleet with an annual purchase of only about 42 MRFs, less than one-third of the planes assumed for the basic estimate. In that case, though, the Air Force's fleet would be considerably older on average than it is today--approximately 18 years in 2010, compared with about 10 years today. Because keeping the age of its fighter fleet low has always been a high priority for the Air Force and because the Air Force has yet to publicly relax its planning goal of 22 years, CBO has assumed that the goal will stand in the future and that 150 MRF aircraft will be purchased each year.

Moreover, even if delays in retirement of the F-16 aircraft permit a reduction or delay in purchases of the MRF, the savings could be offset by purchases of aircraft not assumed in this memorandum. General Mike Loh, Commander of the Air Force's Tactical Air Command, has suggested that the Air Force is considering buying the Navy's AX aircraft as a replacement for the Air Force's F-111, a long-range bomber, beginning late in the next decade.¹⁰ Because the AX aircraft is likely to be expensive, purchase of even a modest number of these planes could offset much of the savings associated with a smaller buy of MRFs.

Nonmajor Procurement

In addition to buying major weapons systems, such as strategic bombers, tactical fighters, and intercontinental ballistic missiles, the Air Force procurement budgets pay for other items, such as satellites, communications equipment, trucks, bombs, and spare parts. Many of these items represent relatively small amounts of money. For example, the "other procurement" account in the 1991 budget request contained almost 200 line items, only four of which contained more than \$100 million.

Detailed plans for these weapons are generally not publicly available. Thus, the costs of nonmajor procurement cannot be estimated in the same way as those for major weapons systems. Instead, estimates of nonmajor procurement in this memorandum are based on general relationships that vary between the lower and higher estimates.

Under the lower estimate, it is assumed that the real level of spending on nonmajor procurement would increase so that, by 2003, this category of funds would receive roughly the same amount of money it received on average in the 1974-1992 period, reduced in proportion to force cuts. CBO used the

10. Barbara Opall, "One on One: General Mike Loh, Commander, U.S. Air Force Tactical Air Command," *Defense News*, November 18, 1991, p. 38.

number of active-duty military personnel as a proxy for forces. This premise is consistent with the assumption that total spending for nonmajor procurement should be related to what was spent on it in the past and to the number of forces.

The higher estimate reflects historical funding patterns for nonmajor procurement. Specifically, this memorandum uses a regression equation derived from the relationship between funding for major and minor procurement for the 1974-1991 period.¹¹ The relationship is statistically significant and suggests that portions of procurement funding for minor weapons increase proportionally to changes in costs for major weapons, while some funding remains constant in relation to major weapons funding.

This statistical relationship may be consistent with the nature of the systems purchased with these funds. Some weapon systems bought with these funds, such as advanced munitions, satellites, radar, and some communications gear, tend to be replaced as enemy systems improve in capability. Thus, it is reasonable to expect that the military will develop new versions of these weapons in the next decade even if forces do not increase in size. It is also reasonable to expect that these systems, which are relatively sophisticated, would display the same types of cost trends as major procurement; that is, new models tend to cost significantly more than their predecessors and actual costs tend to exceed estimated costs. For all these reasons, the costs of sophisticated weapons bought out of funds for nonmajor procurement might well vary in proportion to costs in the total procurement budget. This expectation is consistent with the regression relationship, which shows a statistically significant link between funding for nonmajor procurement and total procurement.

On the other hand, other categories of systems purchased with funds for nonmajor procurement--for example, trucks and fork lifts--should not need replacement as threats change and should not necessarily increase in cost. Therefore, spending for these categories of systems might be expected to remain constant in real terms if forces remain constant. This expectation is consistent with the nonzero constant term in the regression relationship.

The higher estimate of the costs of nonmajor procurement may also be consistent with the potential for growth in the number and cost of space-based assets. As the United States comes to rely more heavily on space for communications and other military missions, costs of assets related to activities in space could rise. Because the long-term plans for deployment of

11. The equation used is $\text{Total Procurement}_t = 1.2 + 1.5 (\text{Major}_t) + 0.7 (\text{Minor}_{t-1})$. The numbers in parentheses are T-statistics. (6.8) (7.2)

these systems are highly uncertain, highly classified, or both, these systems are included as nonmajor procurement items. Sharp growth in the cost of these systems would push the Air Force budget toward the higher estimate in this memorandum.

RDT&E AND MILITARY CONSTRUCTION

The remaining appropriations in the Air Force budget include research, development, test, and evaluation (RDT&E) and military construction. The Administration's plan predicts that RDT&E will decline dramatically in real terms through 1997 (see Table 2). Military construction is projected to dip in 1993 but to grow to levels above 1992 for the rest of the period. This memorandum uses several approaches to project spending beyond 1997.

TABLE 2. U.S. AIR FORCE BUDGET (In billions of 1992 dollars)

	1992	1993	1994	1995	1996	1997
Military Personnel	20.8	19.8	18.4	17.6	17.6	17.3
Operation and Maintenance	23.7	23.7	23.7	23.2	22.9	22.1
Procurement	24.8	28.1	28.3	27.9	27.5	27.4
Research, Development, Test, and Evaluation	15.0	14.6	12.7	10.7	9.4	8.2
Military Construction	1.2	0.8	2.0	1.7	1.6	1.6
Family Housing	<u>1.1</u>	<u>1.1</u>	<u>1.1</u>	<u>1.1</u>	<u>1.0</u>	<u>1.0</u>
Total	86.6	88.2	86.2	82.0	80.1	77.6

SOURCE: Congressional Budget Office based on Department of Defense data.

NOTE: Numbers may not add to totals because of rounding.

The lower estimate of costs assumes that both of these appropriations eventually receive the average amount of funding that they received in the 1974-1992 period, adjusted by the number of active-duty personnel in the Air Force, which serves as a proxy for force size. It is assumed that this funding level would be attained by 2003 for RDT&E and by 2010 for military construction. Although these appropriations are not directly related to the number of forces, this assumption may be plausible in a period when forces do not change in size. The higher estimate also uses this method for estimating military construction.

The higher estimate uses a different approach to estimate RDT&E costs. Funds for RDT&E--which finance basic research as well as the development of new weapons--should be related to estimates of future threats and, therefore, to the number and sophistication of future weapons. None of these factors can be related to the Administration's plans for numbers of major weapons. Nor are the Administration's plans for RDT&E and military construction publicly available beyond 1997. Thus, beyond 1997, the higher estimate of costs in this memorandum assumes that RDT&E would receive the average share of the total Air Force budget that it received in the 1974-1991 period. It assumes that this share would be attained by 2002. This method seems consistent with historical patterns. Between 1974 and 1991, the RDT&E appropriation received an average of about 14 percent of the Air Force budget. This percentage ranged from about 11 percent, about equal to its share in 1997, to 18 percent over this period despite sharp changes in overall funding.

Use of historical shares may also be consistent with the uncertainty about requirements for these appropriations. An investment in RDT&E today produces a new weapon only after a decade or more. Therefore, funding requirements for RDT&E are highly uncertain because threats to U.S. security a decade or two hence are unpredictable. In periods when the overall Air Force budget grows, there will be good arguments about the seriousness of future threats. As a result, new projects may be started, causing RDT&E funding to grow. In a period of declining budgets, the proponents of funding for major systems will be able to fend off requests for new RDT&E projects because future threats are never completely clear. Thus, RDT&E funds will tend to decline in these periods.

TOTAL BUDGET

Adding all Air Force appropriations together yields the totals shown in Figure 1. Under the Administration's plan, the Air Force budget increases from \$85

billion in 1991 to \$88 billion in 1993. After 1993 the budget declines through 1997, reaching \$78 billion in that year.

Through 1999, CBO's lower estimate of the Administration's plan projects that the Air Force budget would continue to decline until it is substantially below 1997 levels. It would reach a nadir in 1999 at a level of about \$72 billion. The continued decline toward the end of this decade reflects expected completion of major procurement programs such as the B-2 bomber and the C-17 airlift aircraft. Decreases in cost that result from completion of the B-2 are not offset by increases in costs in two other programs that enter procurement about this time: the SICBM and the F-22. Under the higher estimate, the budget would decline in 1999 until it is about \$2 billion below the 1997 level. In contrast to the lower estimate, primarily reflecting the impact of assumed higher costs for the SICBM and the F-22 aircraft, the higher estimate of the Air Force budget would grow to about equal 1997 funding by the year 2000.

Beyond the year 2000, the Administration's plan for the Air Force budget increases only modestly under the lower estimate, rising to about \$84 billion in the year 2005 before trailing off to \$81 billion by the year 2010. The increases reflect added funding for new systems, including the F-22 fighter, MRF, and SICBM. Under the higher estimate, which is more consistent with past budgetary experience, the Air Force budget would rise more sharply. It would reach a plateau of \$101 billion in the years 2006, 2007, and 2008, and would decline only to \$98 billion by 2010. This larger increase under the higher estimate reflects anticipated growth in the costs to procure major and some smaller weapons.

Under the lower estimate of costs, the Air Force budget would be only modestly higher than its planned level in 1997, and on average in the 1998-2010 period would approximately equal the 1997 level. Thus, under optimistic cost assumptions, the Air Force would be able to afford its new family of weapons, including the F-22, MRF, and SICBM, even if its budget remains constant in real terms at the planned 1997 level.

Under the higher cost estimates, however, in order to carry out the Administration's plan, the Air Force budget would have to be 26 percent greater in 2010 than its planned 1997 level. The peak years would be more than 30 percent higher, although the average funding needed for the 1998-2010 period--about \$91 billion--is about 17 percent above the 1997 level. Thus, under assumptions that are consistent with past experience, the Air Force could not afford its new family of weapons without budget increases.

Shares Suggest Further Budgetary Pressure

The Air Force may confront other budgetary problems as well. For example, the share of funds devoted to the operating budget in the year 2010 falls to about 41 percent under the higher estimate, but it receives about 50 percent in the lower estimate. In the 1980s, an average of 50 percent of Air Force funding was devoted to operating money. The share was 61 percent in the 1970s. Thus, at least under the higher estimate, operating costs would consume an historically low share, according to CBO's estimates. This low share may suggest that the operating appropriations are underfunded.

During the next decade, the share of the Air Force budget that is devoted to procurement of tactical fighter aircraft would also rise to 9 percent for the higher estimate and 7 percent for the lower in the 1998-2010 period. Procurement funding for tactical fighter and attack aircraft averaged about 5 percent of the Air Force budget for the 1965-1991 period, and was only about 6 percent during the 1975-1991 period, when fighters received more funding. Indeed, the share under the higher cost estimate for the last seven years of the projection, about 11 percent, is approximately 45 percent greater than the share of funding that tactical fighters received during the 1975-1981 period, when funding was at its high point. The unusually high share for tactical aircraft raises the question: Will new programs in strategic, airlift, or other categories, which are currently unforeseen, eventually be deemed necessary and add to budgetary pressure?

The high share for tactical aircraft also explains an earlier CBO result. In April of this year, CBO concluded that unless the Air Force's budget increased in real terms, the service would have difficulty buying all the F-22 aircraft that are contemplated under the Administration's plan.¹² That testimony, which focused only on the F-22 decision, assumed that the share of funding for tactical aircraft remained within the boundaries that have been applied since the mid-1960s. Under the Administration's plan, however, the share for tactical aircraft would deviate markedly from these historical norms.

Overall Air Force Share Could Fall

The Air Force may also face another budgetary problem: its share of the total DoD budget could also decline. If that happens, the service would have significantly fewer funds available to carry out the Administration's plan.

12. Statement of Robert F. Hale before the Subcommittee on Conventional Forces and Alliance Defense of the Senate Committee on Armed Services, April 22, 1991.

Under the Administration's plan, the Air Force would receive about 32 percent of the total DoD budget in 1997. This would be about the same as the average share that the service has received since the early 1970s. If DoD's total budgets do not increase beyond 1997, the Air Force share would have to increase to about 33 percent under the lower estimate and 41 percent under the higher by 2010. But CBO estimates suggest that if they are to carry out the Administration's plan, the Army, and especially the Navy, would also require increased funds during the next decade.¹³ Additional funds would also be needed if the United States is to deploy defenses against strategic missiles. Thus, the Air Force share may decrease, rather than increase, because of increased funding demands from the other military services.

A decline in the Air Force share would also be consistent with past budgetary patterns. Those patterns suggest that the Air Force's share of the budget declines when the service is not buying strategic weapons, as it will during the first decade of the next century (see Figure 4).

Decline in Total DoD Budget

Finally, the total DoD budget may decline below the levels proposed by the Administration. Even before the failed coup in the Soviet Union, the Congress, limited by last year's budget agreement, was faced with the need to cut defense spending below the level proposed by the Administration for 1994 and 1995.¹⁴ In the aftermath of the failed coup, President Bush suggested that events in the Soviet Union may give the United States "an opportunity for a vastly restructured national security posture."¹⁵ Although the President and other Administration officials have not yet agreed to any further cuts in the defense budget, these words suggest the possibility. Moreover, various Members of Congress, and a number of recent studies, have recommended further reductions.¹⁶

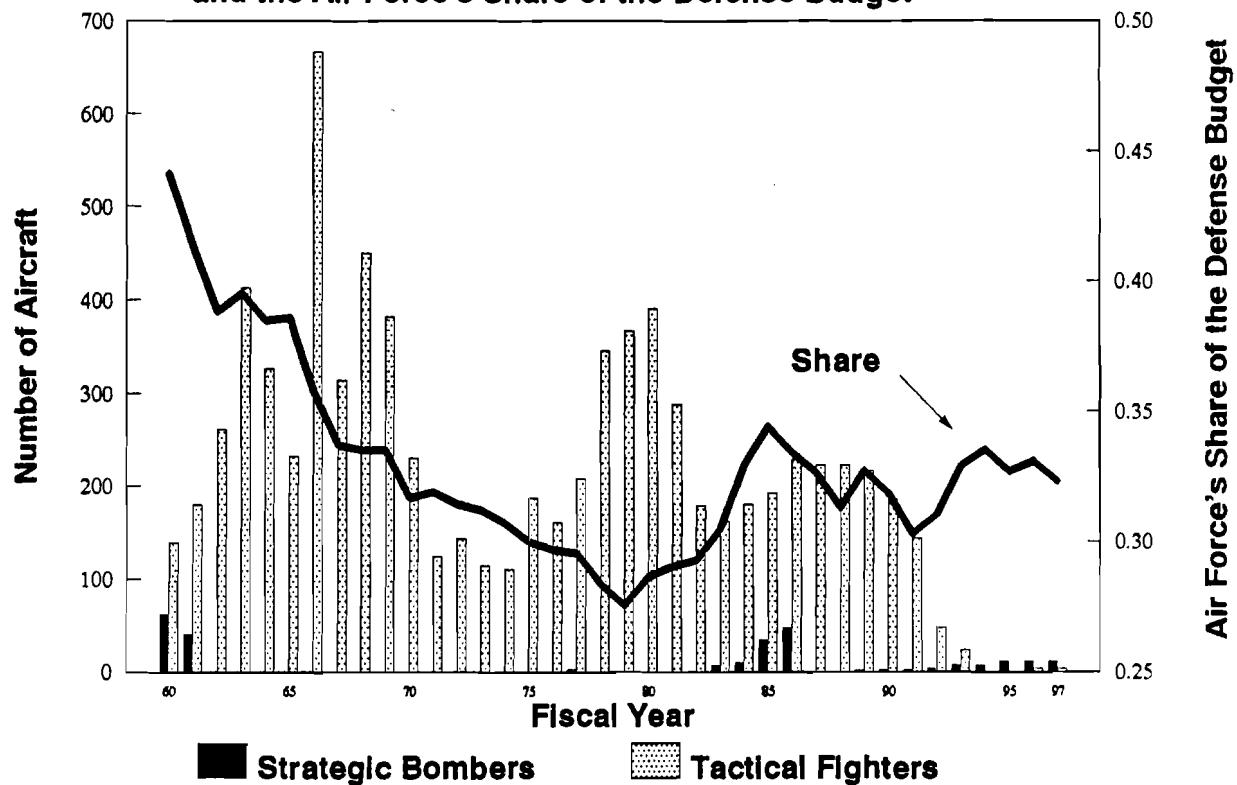
13. "The Costs of the Administration's Plan for the Army Through the Year 2010," Congressional Budget Office staff memorandum (December 1991), and "The Costs of the Administration's Plan for the Navy Through the Year 2010," Congressional Budget Office staff memorandum (December 1991).

14. See Testimonies of Robert D. Reischauer and Robert F. Hale before the Senate Budget Committee, July 16, 1991.

15. Ann Devoy, "Bush: Defense Restructuring Possible," *Washington Post*, August 30, 1991, p. 1.

16. News release from the House Budget Committee, October 7, 1991; statement by Senator Lloyd Bentsen, October 20, 1991; remarks by Senator Jim Sasser at a press conference, October 23, 1991; William W. Kaufman and John D. Steinbrenner, *Decisions in Defense: Prospects for a New Order* (Washington, D.C.: Brookings Institution, 1991).

Figure 4. Procurement of Strategic Bombers and Tactical Fighters and the Air Force's Share of the Defense Budget



SOURCE: Congressional Budget Office from Air Force and Department of Defense Data.

NOTE: Excludes four B-2 bombers bought in 1988 and before.